

# Sanicro® 625

## Bar

## Datasheet

Sanicro® 625 is an extremely versatile nickel-chromium-molybdenum-niobium alloy, suitable for use in severely corrosive environments requiring high strength materials. Mainly suited for wet corrosion environments. Service temperatures ranging from cryogenic to 593°C (1100°F).

This grade is characterized by:

- Extremely good resistance to chloride-induced stress corrosion cracking
- Excellent corrosion resistance in widely varying acidic and chloride containing environments
- Excellent resistance to general corrosion, pitting, and crevice corrosion
- Excellent resistance to corrosion in environments containing hydrogen sulfide
- Very high and even strength the recommended service temperatures
- Very good welding properties
- Good machining and fabrication properties

## Standards

- ASTM: UNS N06625 Grade 1
- UNS: N06625
- EN Number: 2.4856

### Product standards

ASTM B 446 (Grade 1), ASME SB-446 (Grade 1)  
NACE MR0175/ISO15156, NACE MR0103/ISO17945

### Approvals

Approved by the American Society of Mechanical Engineers (ASME) for use in accordance with ASME Boiler and Pressure Vessel Code, Section I, Section III Div. 1 classes 1 and 3, Section VIII div.1.

### Certificate

## Chemical composition (nominal)

### Chemical composition (nominal) %

C	Si	Mn	P	S	Cr	Ni	Mo	Fe	Nb	Co	Ti	Al
<0.025	<0.50	<0.50	<0.015	<0.015	21	62	8.5	<5	3.5	<1.0	0.2	<0.40

Pitting Resistance Equivalent Number, (PRE) >48.

## Applications

### Examples of applications for Sanicro® 625

#### Environmental projects

Waste-to-Energy production  
Pollution control equipment  
Refuse-derived fuel plants

#### Renewable energy

Solar power plants  
Geothermal power  
Bio-fuel production

#### Oil & Gas / Refinery

Well construction and service  
Gas lift equipment  
Wellheads and Christmas trees

#### Chemical processing

Phosphoric acid production  
Pickling operations

#### Marine applications

Drivetrain components  
Offshore piping systems  
Seawater coolant in industries

## Corrosion resistance

#### General corrosion

Sanicro®625 offers excellent resistance to both reducing, oxidizing, and in mixed corrosive environments. The resistance to marine corrosion / sea water is particularly good.

#### Intergranular corrosion

Sanicro®625 is stabilized against intergranular attack by the niobium content, and the extra low carbon content. The resistance to IGC is tested acc. to ASTM G-28 Method A (Streicher test).  
Criteria: Max. 3mm / year.

#### Stress Corrosion Cracking

The nickel content of Sanicro®625 is at 62 % which promotes an excellent resistance to stress corrosion cracking induced by both chlorides and alkalis.  
This makes it virtually immune to chloride-induced SCC, and the resistance to cracking in the presence of H<sub>2</sub>S and chlorides is very high. According to NACE MR 0175 / ISO 15156-3 it is acceptable for use in the oil and gas industry with no environmental limits in respect of partial pressures of H<sub>2</sub>S or elemental sulfur.

#### Pitting and crevice corrosion

Sanicro®625 have an extraordinary resistance to pitting and crevice corrosion in seawater at a variety of

temperatures. With PRE number  $\geq 48$ , Sanicro®625 is one of the grades which is least susceptible to these types of corrosion.

## Forms of supply

### Diameters and finished condition

Sanicro®625 is stocked in imperial dimensions.

Diameter range: 76.2mm-228.6mm (3"-9")

Delivery condition: Soft annealed, peel-turned and ground to final finish.

### Lengths

Bars are delivered in random lengths of 3-6.9 m, depending on diameter.

### Straightness, metric units

Height of arch, 2 mm/m

### Tolerances, metric units

Diameter tolerances: -0 / +0.79 mm

Surface finish: Ra, max. 3 $\mu$ m

## Heat treatment

The Sanicro®625 stock program bars are delivered in soft annealed and quenched condition. Annealing at min. 910°C (1670°F) followed by quenching in water.

## Mechanical properties

### Tensile strength

Min. values at room temperature:

Dimension	Proof strength Rp0.2	Tensile strength Rm	Elongation A5
D $\leq$ 101.9mm	415 MPa / 60 ksi	830 / 120 ksi	30%
D $>$ 101.9mm	345 MPa / 50 ksi	760 / 110 ksi	30%

### Impact strength

-60°C Min. values	Longitudinal	Transversal (D $>$ 60mm)
Average	68J	47J
Single	61J	41J

### Hardness

Hardness in the delivery condition is max. 35 HRC.

## Physical properties

Density, at 20°C: 8.4 g/cm<sup>3</sup>, 0.31 lb/in<sup>3</sup>

### Thermal conductivity

Temperature, °C	W/(m °C)	Temperature, °F	Btu/(ft h°F)
20	9.8	68	5.7
100	10.8	200	6.2

200	12.5	400	7.2
300	14.1	600	8.2
400	15.7	800	9.1
500	17.5	1000	10.1
600	19	1200	11
700	20	1400	12
800	22.8	1600	13.2
900	25.2	1800	14.6

### Specific heat capacity

Temperature, °C	J/(kg °C)	Temperature, °F	Btu/(lb °F)
20	410	68	0.10
100	427	200	0.10
200	455	400	0.11
300	475	600	0.12
400	505	800	0.12
500	525	1000	0.13
600	550	1200	0.14
700	575	1400	0.14
800	600	1600	0.15
900	625	1800	0.15

### Thermal expansion, mean values in temperature ranges (x10<sup>-6</sup>)

Temperature, C	Per °C	Temperature, °F	Per °F
30-100	12.5	86-200	7
30-200	13	86-400	7.5
30-300	13.5	86-600	7.5
30-400	13.5	86-800	7.5
30-500	14	86-1000	8
30-600	14	86-1200	8
30-700	15	86-1400	8.5
30-800	15.5	86-1600	9
30-900	16	86-1800	9

### Resistivity

Temperature, °C	$\mu\Omega\text{m}$	Temperature, °F	$\mu\Omega\text{in.}$
20	1.30	68	51.2
100	1.32	200	52.0
200	1.34	400	52.8
300	1.35	600	53.2
400	1.36	800	53.5
500	1.37	1000	54.3
600	1.38	1200	54.3
700	1.38	1400	54.0
800	1.38	1600	53.5
900	1.38	1800	53.1

**Modulus of elasticity ( $\times 10^3$ ) (annealed condition)**

Temperature, °C	MPa	Temperature, °F	ksi
20	208	68	30
100	203	200	29.5
200	198	400	28.5
300	193	600	28
400	187	800	27
500	181	1000	26
600	174	1200	24.5
700	166	1400	23.5
800	156	1600	21.5

**Modulus of elasticity ( $\times 10^3$ ) (solution annealed condition)**

Temperature, °C	MPa	Temperature, °F	ksi
20	205	68	29.5
100	200	200	29
200	194	400	28
300	188	600	27
400	182	800	26
500	176	1000	25
600	169	1200	24
700	162	1400	23

## Welding

The weldability of Sanicro® 625 is good. Suitable methods of fusion welding are manual metal-arc welding (MMA/SMAW) and gas-shielded arc welding, with the TIG/GTAW method as first choice.

For Sanicro® 625, heat-input of <1.2 kJ/mm and interpass temperature of <100°C (210°F) are recommended. A string bead welding technique should be used.

### Recommended filler metals

TIG/GTAW or MIG/GMAW welding:  
ISO 18274 S Ni 6625/AWS A5.14 ERNiCrMo-3 (e.g. Exaton Ni60)

MMA/SMAW welding:  
ISO 14172 E Ni 6625/AWS A5.11 ENiCrMo-3 (e.g. Exaton Ni60)

## Machining

Materials in this group of alloys (N06625) are challenging to machine. This is due to a number of properties, leading to high cutting forces, severe wear and poor chip control. Dedicated cutting tools and strategies to be used. For details on tool geometries, tool grades and cutting data, the tool supplier should be able to support.

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**Disclaimer:** Recommendations are for guidance only, and the suitability of a material for a specific application can be confirmed only when we know the actual service conditions. Continuous development may necessitate changes in technical data without notice. This datasheet is only valid for Alleima materials.